HILSA FISHERIES IN THE NARBADA RIVER[1]

BY

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(*With three text figures*)

(Communicated by Dr. S. B. SETNA, F.N.I.)

CONTENTS

INTRODUCTION

Hilsa is noted for its valuable fisheries in the lower reaches of rivers in Bengal, eastern coast of Madras and Sind. Day (1878), who paid close attention to the spawning migrations of this fish in different Indian rivers, did not record its occurrence in any of the fluvial waters of the west coast of peninsular India. Sundara Raj (1917) concluded, therefore, that Hilsa did not occur on the west coast of India except the Indus. Later, Prashad, Hora and Nair (1940, p. 530) quoting Cuvier and Valenciennes stated that M. Dussumier had obtained the fish in Bombay. Moreover, Campbell (1877, p. 362) had also recorded a plentiful supply of Hilsa in the estuaries of the Narbada; and for the past 30 years it is imported in large quantities into Bombay where, it forms the mainstay of quality fish during the monsoon. In recent years, Prater (1940), Moses (1940 and 1942) and Pillay (1948) also referred to Hilsa fisheries in and around the Gulf of Cambay.

These observers, dealing as they did, with fisheries in general, did not pay special attention to Hilsa. Recently, the author had an opportunity to study the breeding habits and early life history of the fish in the Narbada (Kulkarni 1950). Observations made on this occasion show that this potential source of food and wealth deserves more careful attention, both from a commercial and a scientific point of view. Details of this fishery as a preliminary note to further study are given below.

Acknowledgment.—I am grateful to Dr. S. B. Setna, Director of Fisheries, Bombay, for his constant encouragement and for the facilities afforded to me for the compilation of this paper.

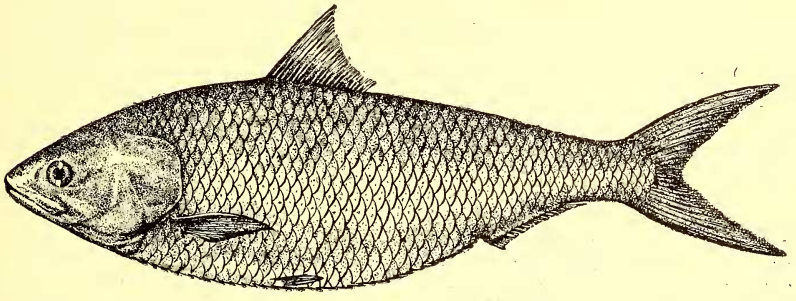
[1] Published with the kind permission of the Director of Fisheries, Bombay.

Local Nomenclature of Hilsa

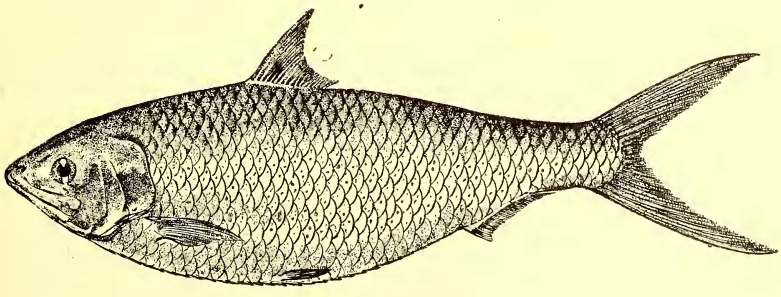
The Hilsa is known around Bombay as 'Pala', a similar term, viz., 'Palla' being used to designate the same fish in Sind. The fish is, however, known differently around Broach where it is called 'Chaksi' or 'Chaski'. Considerable confusion arises in the common mind on account of Hilsa (*H. ilisha*) being mistaken for a similar fish, *Hilsa toli,* both of which occur in the same areas. Even scientifically, the differences, according to Day (1889) are not very pronounced as will be apparent from the following:—

Hilsa toli (C. and V.)	*Hilsa ilisha* (Ham.)
D–16–17.	D–18–19.
A–19–20.	A–19–22.
Ll.–39–40.	Ll.–46–49.
L. tr–13–14.	L. tr. 17–19.
Head 5 to 5¼ times in total length.	Head 4¼ to 4½ times in total length.
12–13 scutes behind the pelvics.	14–15 scutes behind the pelvics.

The illustrations in text fig. 1 (*a*) and (*b*) show that in superficial appearance both the fishes are similar and one can easily be mistaken for the other. It seems that the confusion is common even in Bengal where



(*a*)



(*b*)

Text fig. No. 1: (*a*) *Hilsa ilisha* (Ham.) 2 × ; (*b*) *Hilsa toli* (C. & V.) 2 ×

Hilsa toli is known as Chandana Hilsa (Hora and Nair 1940*b*). *H. toli* is known as 'bhing' around Bombay and 'modar' at Broach. The

local names of these two fish are thus quite distinct; yet, the similarity of form and appearance leads to considerable confusion, in less critical minds, so much so that in Broach, the names 'chaksi' and 'medar' are sometimes used—indiscriminately. Consistency in the use of the names is lax. Another anomaly noted in the same area (Broach) is that instead of using the name 'chaksi' for both sexes of Hilsa, only gravid Hilsa is called chaksi and the male is termed 'palva' for trade purposes. Even a male 'bhing' or a small size non-gravid female 'bhing' is classed as Palva. If a specimen is less than 6 ins., whether of Palla or Bhing it is known as Palvi or Palavdi.

Pillay (1948, p. 58) records 'palwa' as the local name of *H. ilisha* and 'choksi' (= chaksi) as that of *H. toli* in the Kodinar-Madhwad area. Moses (1940), on the other hand, mentions 'palwa' as the local name of *Clupea toli* (= *H. toli*) and 'modar' as that of *H. ilisha* at Baroda. My own examination of specimens obtained from Madhwad establishes beyond doubt that the fish known as 'palwa' in Kodinar-Madhwad area is *H. toli* and the 'chaksi' as *H. ilisha*. Inquiries made with the importers of fish to Bombay from Kodinar area also confirm these findings. This brings to mind the fact that observations made by Pillay (1948) regarding 'palwa' taking it as *H. ilisha*, including the statistical figures recorded by him (loc. cit. pp. 58-61), relate in fact to *H. toli* and those for his 'choksi' are for *H. ilisha*.

The local names of this fish are thus confusing and much reliance cannot be placed on the terms used by local fishermen without actual examination of the specimens. These discrepancies are detailed here, as otherwise scientific workers are apt to be misled by accepting reports from less scrutinizing persons particularly because of the close similarity of form and habitat of the two fishes concerned.

In order to facilitate field identification of specimens a rough field key is furnished hereunder :—

		H. toli	*H. ilisha*
Scales	...	Large (Ll. 39-40).	Small (Ll. 46-49).
Head	...	About 1/5 total length.	About 1/4 total length.
Dorsal fin	...	Upper margin distinctly concave.	Slightly concave.
Tail	...	Long caudal lobes (almost equal to the length of the head).	Short caudal lobes (shorter than the length of the head).

Generally, the term Hilsa denotes *H. ilisha* in the entire north-eastern India as well as in scientific literature, unless stated otherwise. This usage of terms is also followed in this paper.

Distribution of Hilsa on the West Coast

The references quoted earlier show that the occurrence of Hilsa in the Narbada as well as around Bombay is known for over a century, though in the intervening period some of the authors were not aware of it. Recent observations have shown that the distribution of the fish is not limited to this region only but extends over a much wider area along the coast. Its occurrence on the Kathiawar coast (Pillay, 1948), in the Purna river near Navsari, (Moses, 1942) and the Ulhas near Bassein (Kulkarni, 1950) has already been recorded. Further in-

vestigations have located this fish in the estuary of the Savitri river near Bankot about 70 miles south of Bombay, as well as in the estuary of the Kali river near Karwar. Chacko and Ganapathi (1949) record its occurrence on the Malabar coast also. This indicates that although there is no record from rivers in the intervening areas it may be assumed that the distribution extends definitely up to Malabar coast and may extend even further south.

Pillay's record of Hilsa fishery off the coast of Kodinar (op. cit.) as well as the occasional occurrence of this fish in the catches of the gill nets of the fishermen of Bombay, fishing about 10 to 15 miles away from the coast, in December and January, lend additional support to the assumption that Hilsa inhabit the offshore areas. However, whether on the west coast, Hilsa sojourns in the estuaries for two years in the same manner as it does, as stated by Sundara Raj (1937) in case of the estuaries on the east coast of Madras, is yet to be determined.

Another observation recorded was that though the river Tapti is so close to the Narbada and has a fairly large and perennial flow, the number of Hilsa ascending the river is very small, so much so that there is hardly any Hilsa fishery during the monsoon. Although both rivers are sufficiently wide at the mouth and have a voluminous flow of water, yet very few Hilsa are found in the Tapti. These rivers thus afford an excellent venue to determine the possibility of homing instinct in Hilsa as also to study the requirements of a successful run of Hilsa by a comparison of the conditions obtaining in these two sheets of water.

Migration of Hilsa in the Narbada

Recent observations indicate that though Hilsa has been found to occur generally in the Gulf of Cambay as well as the coastal areas, it is abundant only in the River Narbada. The river being the largest on the west coast after the Indus, is by far the best haven for Hilsa on this coast. It is, therefore, worthwhile to recount a few particulars of this river.

The Narbada has a total length of about 800 miles and has its origin in the Amarkantak Hills in the Bilaspur District of C.P. (Madhya Pradesh). It drains an area of about 36,400 sq. miles and flowing between the ranges of the Vindhya and the Satpura Hills finally debouches into the Gulf of Cambay. The only important town near its mouth is Broach which is 200 miles north of Bombay. According to Campbell (op. cit.), the discharge of the river in times of maximum floods is of about two and a half million c.ft. per second. To give some idea of the volume of water flowing down the Narbada, it has been estimated that in a season with average rainfall of 36 inches, a lake 324 sq. miles in area and 100 feet deep would be required to receive its waters. The total quantity of water is also estimated to be about $\frac{1}{8}$ the capacity of the Gulf of Cambay. In fair weather the velocity of the river water near Broach is 1.25 ft. per second or a little less than a mile per hour. The width of the river is about a mile near Broach, the course thereafter widening into an estuary whose shores where they fall away into the gulf area are more than 13 miles apart. Nevertheless, the estuarine area is rather limited when compared with the extensive estuarine area of the Ganges, Indus etc. It can, however, be said that the Gulf of

Cambay itself is a vast estuary owing to such rivers as the Sabarmati, Mahi, Tapti, etc., emptying into the Gulf, in addition to the Narbada.

The migration of Hilsa in this river as stated by the author (1950) commences generally in July when the first floods occur in this area and continues up to middle of September. The ascent of the fish in the river does not, however, extend over a long distance, probably on account of the course of the river being rather steep, passing as it does through hilll ranges of both the Vindhya and the Satpuras. The upstream limit of the ascent known so far is a series of rapids from Garudeshwar to Gora and Makhadi villages about 100 miles from the sea, which marks the lower or westward limit of steep hill tracts over which the river flows with considerable rapidity during the monsoon. The range of migration of the fish is thus limited to the lower reaches of the river and is certainly short as compared with the extensive tracts travelled by the fish in the Indus, Ganges etc.

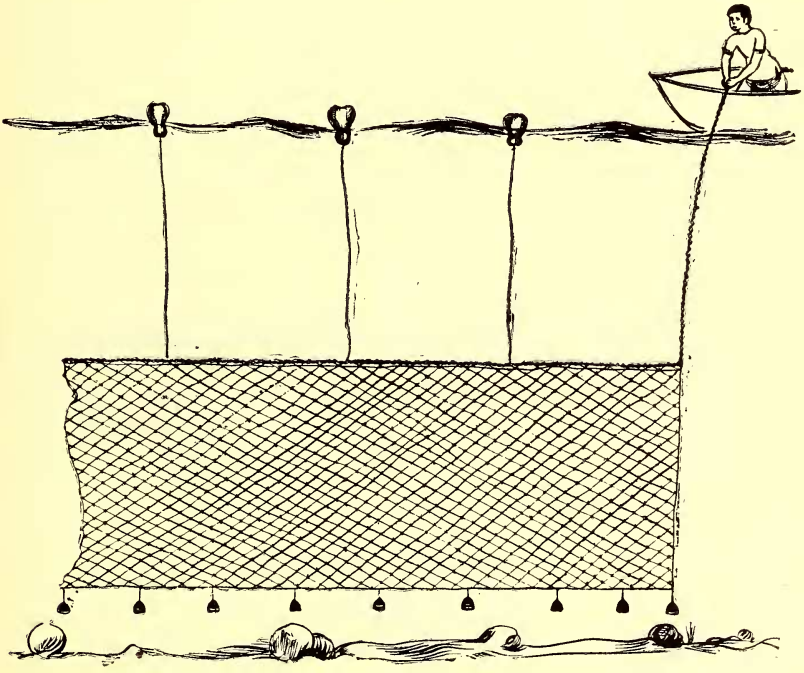
The extreme seaward point where shoals of Hilsa are sighted during their migrations and are sought for by the fishermen, is the village of Bhadbhoot about 18 miles downstream of Broach. The major portion of fishing is done, however, near the town of Broach which commands a large fishermen population hailing from the neighbouring hamlets of Hansot, Vyajalpur, Maktanpore etc. There are twenty other villages along the up-stream course of the river which undertake Hilsa fishing in the season, Jhanore being the last important fishing village.

The lunar periodicity in the ascent of Hilsa in the Narbada, has already been elucidated by the author (1950) Fish is caught on a commercial scale only during spring tide especially from the 12th day of each lunar fortnight up to the first or second day after full moon and new moon. Furthermore, it has been observed that even during the spring tide days, the catches are at their maximum during the high water period. This indicates that the duration represents the peak period of movement of Hilsa and the netting operations become more fruitful during this time only. Prospects of fishing after the spring tide are so meagre that fishermen suspend fishing during neap tide and utilize the time in mending nets and repairing boats.

Another interesting aspect of the migration of Hilsa in the Narbada is the appearance of a small run after the normal monsoon run, which begins in March and continues up to the middle of April. This run being small, fish caught around Broach are consumed locally. Whether the run really ceases after April or continues unnoticed and develops into a major run in July and August has yet to be determined. It may be mentioned, however, that this run is similar to the small run of Hilsa which occurs in the Indus and the Irravadi in March and April (Day 1873, p. 23). The cause of this run in these large rivers is attributed by Day (loc. cit.) to the melting of snow in summer in their upper reaches causing a minor flood. Hora and Nair (1940) (*a*) also observed a minor peak period in the breeding of Hilsa in the Hooghly which they attributed to the flooding of the river due to the Nor'Westers. In the Narbada, however, there is no such possibility, as at no stage, the river passes through any snow clad mountains and there is not the slightest increase in the level of water in March and April.

Methods of Hilsa Fishing in the Narbada

The usual gear employed for large scale capture of Hilsa in the Narbada river is sunken drift-nets. They are ordinary drift nets, but, instead of floating near the surface they are set almost near the bottom and drift at that level. Each piece is about 72 feet long and 7 feet deep. Ten or twelve such pieces are joined together end to end as a single unit and are allowed to drift as a vertical wall. The nets are generally made of twisted hemp with a mesh of 5″ (stretched mesh). Triangular pieces of burnt clay with a hole in the centre or some other similar articles are tied to the lead line and used as sinkers. About 16 floats, generally made of dry gourds are tied to the cork line (head rope) to keep the entire net erect in the water. The net is similar to the 'Palwa Jal' or 'Hilsa net' described by Pillay (1948), which fishes at the surface. The position of floats on the surface gives the impression that the net is on the surface, but actually there is a long string between the floats and the net (text fig. No. 2). This length is adjusted according to the depth of water



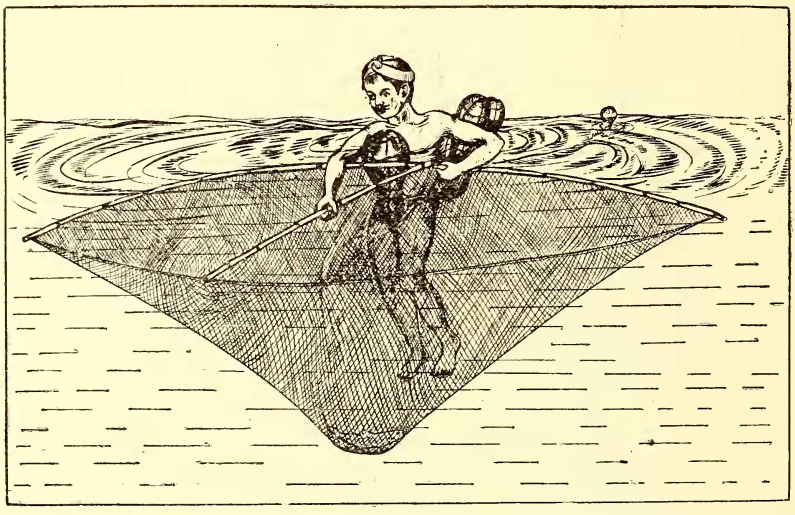
Text fig. No. 2: A part of Hilsa net (diagrammatic).

fished so that the net remains in reality near the bottom of the river. In some places the earthen sinkers dangle half a foot below the head line (foot rope), so that the chances of the net getting entangled into the bottom debris are reduced.

The boats used for the fishing are all flat bottom boats of about a ton in capacity varying from 20 to 30 feet in overall length. Each boat has a crew of three or four, one of whom is a skipper ('tindel') who manages the boat while the others operate the nets. After the net is

cast, one end of it is tied to the boat which also drifts along with the net. It is paid out across the stream almost at right angles to the current so that it drifts downwards slowly and the fish swimming upstream are enmeshed in it. After about half an hour, the net is hauled up to remove the catch and is paid out again for further operations. During spring tide period, these operations are continued day and night, and are suspended only when the catches dwindle towards the end of spring tide period.

'Jamda nets'.—In addition to professional fishermen who fish with drift nets, there is another class of people, viz., 'Bhil' fishermen who catch the ascending Hilsa with small hand nets known as 'Jamda' nets. They follow the hazardous method of negotiating the flooded river on a float made of gourds or dry pumpkins and catch the fish in their purse-like hand nets. The float is known as 'ghodi' which is made by securing together three dry gourds with coir string. Two of them are tied close together on one side and the third is attached with a broad strap in between. The gourds are encased in a mesh-work of coir string so that they do not slip and are less exposed to the danger of damage. A Bhil fisherman rides this float (ghody) which supports him and keeps him above the surface of the water. He can thus remain erect in the water with his hands and legs free. In his hands he holds his small 'Jamda' net which appears like an open bag (text fig. No. 3), while his legs are free to steer his course through the water. The net has an 8 ft. long slightly curved rod which



Text fig. No. 3: The ' Jamda' net in operation (diagrammatic).

forms half of the upper margin or the mouth of the net, the other half portion of the mouth being formed of only a string line. To both these portions a purse-like netting is attached which together forms a complete net. When the net is to be operated, another straight rod, 4 feet long, is attached by its proximal end to the middle of the curved rod and to its distal end the marginal string of the net is

stretched and attached in bow-and-arrow fashion. When ready for use, the curved rod appears like a bow, the marginal string of the netting as the string of the bow and the straight rod takes the place of an arrow mounted on a bow as shown in the illustration (text fig. No. 3).

The fisherman carries the gear on his back, but when he jumps into the flooded river, he mounts the float and travels downstream with the net in his hands. In this manner, he drifts with the flood with the net immersed in water, the open mouth of the net facing the ascending fish. He heads forward in this way through the middle of the river, where the water is sometimes 20 to 25 feet deep. As soon as an ascending Hilsa strikes the net, he immediately lifts the net and secures the fish. In order to store the catch, a string is passed through the gill opening of the fish and kept floating in the water with the help of another small dry pumpkin tied to the other end of the string. The fisherman thus dispenses with the encumbrance of carrying his catch and keeps his hands and legs free for his job.

On the Narbada, the 'Bhil' fishermen wait on the banks for the right time of the tide—,the high tide period representing the maximum movement of the fish—and then enter the river in groups with their nets. The nets appear like bows and arrows stretched taut and give the impression of a small army invading the river which also appears tumultuous and sullen red owing to the muddy flood water flowing swiftly downwards. In the stream, they drift in a row of 8 or 10 in a line and thus cross about five miles at a time. At Jhanore, a fishing village about 12 miles east of Broach, about 100 such 'Jamdawallas' jump into the river and drift up to Nicora, another village about five miles downstream. The catches made by these nets are not large, being about 5 to 10 fish per head.

The method is certainly interesting but at the same time hazardous. It is identical with that adopted by the fishermen in Sind (Day 1873, p. 66) where they float down on a gourd or a hollow earthen pot and catch fish by purse net. Further details of this method are lacking to facilitate comparison, but in one of the methods, where an earthen pot is used as a float, a spear is used to pierce the ascending fish, according to Sebastien Manrique (as quoted by Prashad *et al* 1940).

Most of the fish caught by the professional fishermen with gill nets are gravid females heavy with roe and weighing on an average 4 lb. a piece. Their lengths vary from 17″ to 20″. The males are fewer in number and are comparatively smaller than the gravid females. The paucity of males in the catch may be explained by the possibility that the males being comparatively slender bodied are not ordinarily gilled in the nets intended for gravid females which are heavily built. This assumption is supported by the observation that the 'Jamda' net which has small meshes ($2\frac{1}{2}$″ stretched mesh) catches a larger number of males along with a few ripe females.

Disposal and Potentiality of the Yield

Fish caught by many fishermen is collected together at the landing site by merchants, who, advance money to them for nets, boats and other accessories and receive fish at a predetermined rate. Hardly 10% of fish is sold in the local market in the fresh condition. The bulk

of the fish with roe is packed in wooden boxes in ice and despatched to Bombay by rail, where there is a consistent demand for it. Part of the ice required by the trade is available locally at Broach, while additional supplies are obtained from Bombay. Fish landed at centres with a limited local demand and absence of export facilities to Bombay are cured with salt. The roe is cured and marketed separately.

Collection of accurate statistics of quantities of Hilsa landed annually, has been difficult as catches of *H. ilisha* and *H. toli* are generally mixed up both at the collecting as well as consuming centres. From information gleaned from fishermen as well as from the records of fish merchants, it is possible to arrive at a rough estimate. Each boat, in a normal season of five spring tides, (from July to middle of September), it is estimated, collects about a thousand fish. The number of fishing boats in the Narbada which are annually engaged in Hilsa fisheries is about 400. Thus, the total catch of Hilsa alone in the river totals about 16,00,000 lb. per year which at the present retail rate is worth Rs. 10,00,000.

Depletion of the Fishery

Fishermen complain of a general diminution in the catch of fish in the past few years. A possible explanation may be the intensified fishing from the increased number of boats in recent years. This naturally results in smaller catches per unit of effort. Although there are no accurate statistics to verify this presumption, observations at Broach, as well as the records of fish imported into Bombay by rail from there, do point to a definite diminution in the former catches of fish. Several factors may account for the diminished yield. It may be the result of (1) natural fluctuation in the population of the fish in the estuary or (2) a definite reduction in the rate of replenishment of the fish population due to the depletion of stock. The reduced catches might also have represented the lowest level in a period of abundance, similar to the five year cycle recorded by Hora and Nair (1940b) in respect of the Hilsa fisheries of Bengal. Statistics are necessary to show whether there is a real decline in the fisheries, requiring man's intervention for their restoration, or if it is simply a temporary natural fluctuation which will remedy itself. All explanations are bound to be merely speculative in the absence of systematic observations conducted on a scientific basis on the spot. Only then can remedial measures be suggested.

Summary

Occurrence of Hilsa in the Narbada was recorded as early as 1877. Considerable confusion prevails regarding the correct identity of *Hilsa ilisha* and *H. toli* both of which are somewhat similar in appearance and habitat. Local names are also confusing at some fishing centres.

Distribution of *Hilsa ilisha* on the western coast of peninsular India extends from the Kathiawar coast in the north to the Malabar coast in the south. In the Narbada, the migration of the fish extends only up to about 80 to 100 miles upstream, few if any ascending the adjoining river Tapti.

Hilsa fishing is generally conducted in the river Narbada with sunken drift nets, but another interesting method of fishing with 'jamda' nets is practised by Bhil fishermen (aboriginal tribe) who float on dry gourds in the flooded river for hours and catch the ascending fish. Hilsa fishing constitutes a valuable source of food, most of the fish being exported to Bombay in ice during the monsoon. Depletion of the fishery due to intensive fishing is, however, feared. Without established data no satisfactory solution can be devised to counteract the problem of diminished yield. The Narbada offers a suitable venue for detailed investigation.

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